# UNDERWATER BRIDGE INSPECTION REPORT

STRUCTURE NO. 7137

CR NO. 32

OVER THE

WATSON SAG CHANNEL

DISTRICT 8 - CHIPPEWA COUNTY

PREPARED FOR THE

MINNESOTA DEPARTMENT OF TRANSPORTATION

BY

COLLINS ENGINEERS, INC.

JOB NO. 5221 (CEI 92)

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

REPORT SUMMARY:

The substructure units inspected at Bridge No. 7137, Piers 1 through 6, were found to be in satisfactory condition with minor splitting and checking of the timber members. Numerous diagonal cross braces were split through the connection to the timber piles or broken off completely. The steel piles were in good condition and displayed only a light layer of corrosion from just above the waterline to the channel bottom. The channel bottom around the substructure units appeared to be in stable condition with no evidence of significant scour or appreciable changes since the previous inspection.

INSPECTION FINDINGS:

(A) The timber piles of the piers were in satisfactory condition. The piles were typically weathered with minor splitting and checking over the entire height of pile with maximum widths of 1/4 inch and maximum penetrations of 1 inch.

(B) In numerous locations across the structure, the timber bracing was split through the pile fasteners and/or broken off completely.

(C) The steel piles were generally in good condition with light corrosion observed from the waterline to the channel bottom, with some random pitting having a maximum penetration of 1/16 inch and with nodular corrosion up to 1/8 inch thick over 10 to 25 percent of the pile surface area. Nodular corrosion is primarily on three steel H-piles at Pier 2.

(D) Two piles were split above the waterline at Pier 6. Pile B was split from the top of the pile to 2 feet above the waterline with a maximum width of 3/4 inch and up to 3 inches of penetration. Pile D was split from the top of the pile to 8 feet above the waterline with a maximum width of 1/2 inch and up to 2 inch of penetration.

RECOMMENDATIONS:

(A) Replace the split and/or broken diagonal timber cross bracing to restore the lateral stability of the structure.

(B) Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Daniel G. Stromberg

Date 6/30/2008 Registration No. 21491

Respectfully submitted,

COLLINS ENGINEERS, INC.

Daniel G. Stromberg
Registered Professional
Engineer, State of Minnesota

MINNESOTA DEPARTMENT OF TRANSPORTATION
UNDERWATER BRIDGE INSPECTION

1. BRIDGE DATA

Bridge Number: 7137

Feature Crossed: Watson Sag Channel

Feature Carried: CR 32

Location: District 8 - Chippewa County

Bridge Description: The superstructure consists of seven multiple timber beam spans. The superstructure is supported by six piers, composed of six timber piles and two steel shell piles, and two timber abutments. The piers are labeled 1 through 6 starting from the south end of the bridge.

2. INSPECTION DATA

Professional Engineer/Team Leader: Daniel G. Stromberg, P.E., S.E.

Dive Team: Clayton G. Brookins, Valerie Roustan

Date: October 20, 2007

Weather Conditions: Sunny, 65°F

Underwater Visibility: Negligible/None

Waterway Velocity: Negligible/None

3. SUBSTRUCTURE INSPECTION DATA

Substructure Inspected: Piers 1 through 6.

General Shape: The piers consist of a timber pile cap supported by a single row of six timber piles and two steel pipe piles. The steel piles, on the east side of the bridge, appear to be associated with a deck widening after original construction.

Maximum Water Depth at Substructure Inspected: Approximately 10.3 feet.

4. WATERLINE DATUM

Water Level Reference: Top of pile cap on the west end of Pier 6.

Water Surface: The waterline was approximately 10.3 feet below reference.
Waterline Elevation = 933.7.

5. NBIS CODING INFORMATION (Minnesota specific codes are used for 92B and 113)

Item 60: Substructure: Code 6

Item 61: Channel and Channel Protection: Code 8

Item 92B: Underwater Inspection: Code B/10/07

Item 113: Scour Critical Bridges: Code I/95

Bridge is scour critical because abutment or pier foundation is rated as unstable due to observed scour at bridge site.

_____Yes X No

Photograph 1. View of Pier 1, Looking Northeast.

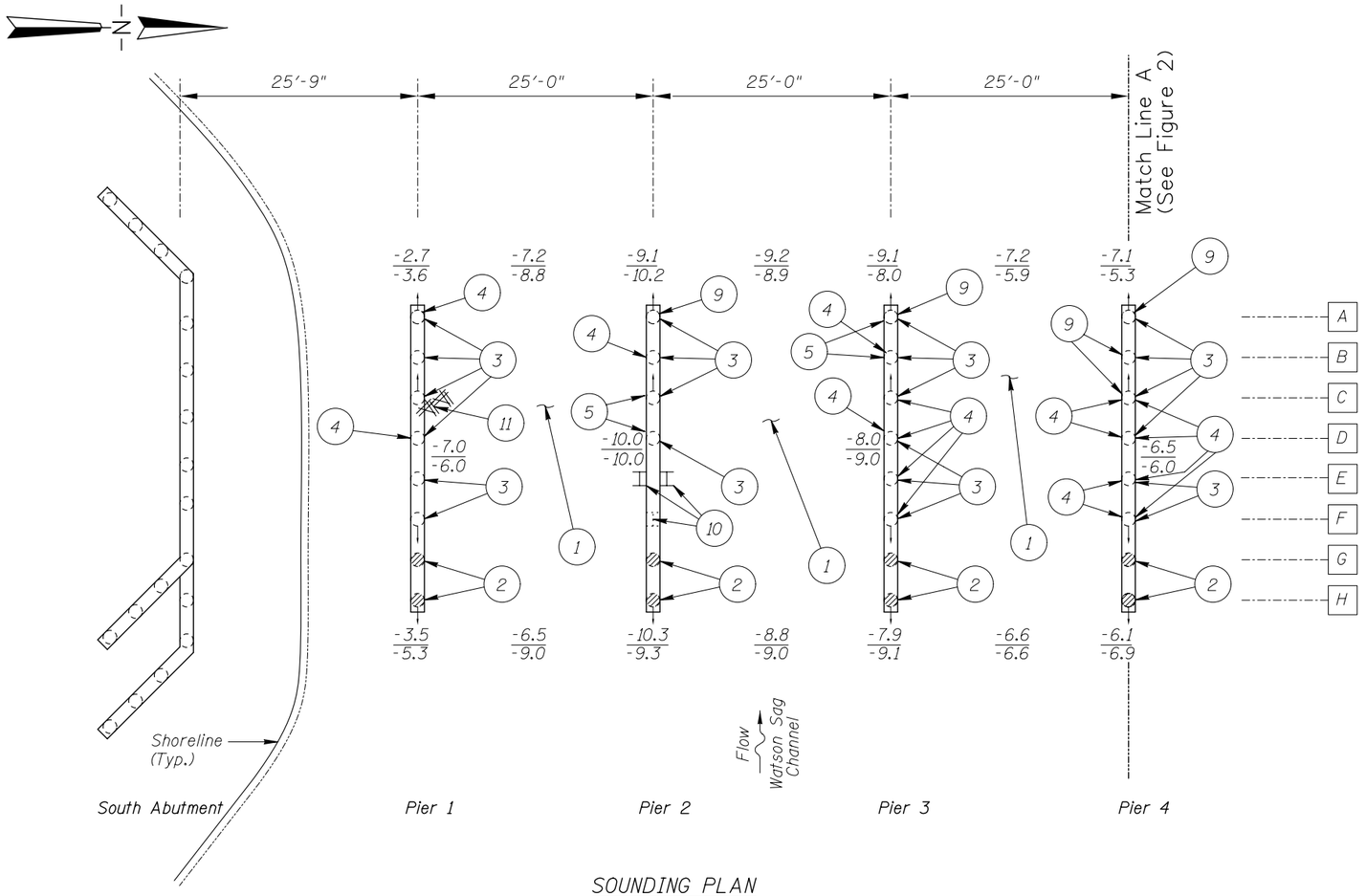
Photograph 2. View of Piers 2, Looking Northeast.

Photograph 3. View of Pier 3, Looking Northeast.

Photograph 4. View of Pier 4, Looking Northeast.

Photograph 5. View of Pier 5, Looking Northeast.

Photograph 6. View of Pier 6, Looking Northeast.




SOUNDING PLAN

TYPICAL END VIEW OF PIERS

*GENERAL NOTES:*

1. Piers 1 through 6 were inspected underwater.
2. At the time of inspection on October 20, 2007, the waterline was located approximately 10.3 feet below the top of the pile cap at the downstream end of Pier 6. This corresponds with a waterline elevation of 933.7
3. Soundings indicate the water depth at the time of inspection and are measured in feet.
4. Soundings were taken along the bridge at the midpoints between the substructure units.

*INSPECTION NOTES:*

(1) The channel bottom material consisted of sandy silt and scattered 6 inch diameter stones with up to 3 inches of probe rod penetration.

(2) Light corrosion was observed on the steel piles from 3 feet above the waterline to the channel bottom with random minor pitting having a maximum penetration of 1/16 inch.

(3) Minor splitting and checking of the timber piles was observed from the pier cap to the channel bottom with a maximum width of 1/4 inch and a maximum penetration of 1 inch.

(4) Diagonal timber bracing was split through the fastener (1/4 inch width typically).

(5) Abrasion damage observed on the timber pile, from 1 foot above the waterline to 2.5 feet below the waterline, approximately 8 inches wide with a maximum penetration of 0.5 inch, and pile section loss of 10%.

(6) Delamination on outer shell of timber pile was observed around the waterline with maximum penetration of 1/2 inch.

(7) Split in pile, from the top of the pile cap to 8 feet above the waterline with a maximum width of 1/2 inch and 2 inch of penetration.

(8) Split in pile, from the pile cap to 2 feet above the waterline with a maximum width of 3/4 inch and 2 to 3 inches of penetration.

(9) Diagonal bracing broken and no longer attached to pile.

(10) Piles E and F at Pier 2 were replaced with three steel H-Piles connected with steel bracing. Piles exhibited nodular corrosion up to 1/8 inch thick over 10-25% of surface area below water.

(11) Light timber debris was observed on the north side of pile.

*Note:*

All soundings based on 2007 waterline location.

*Legend*

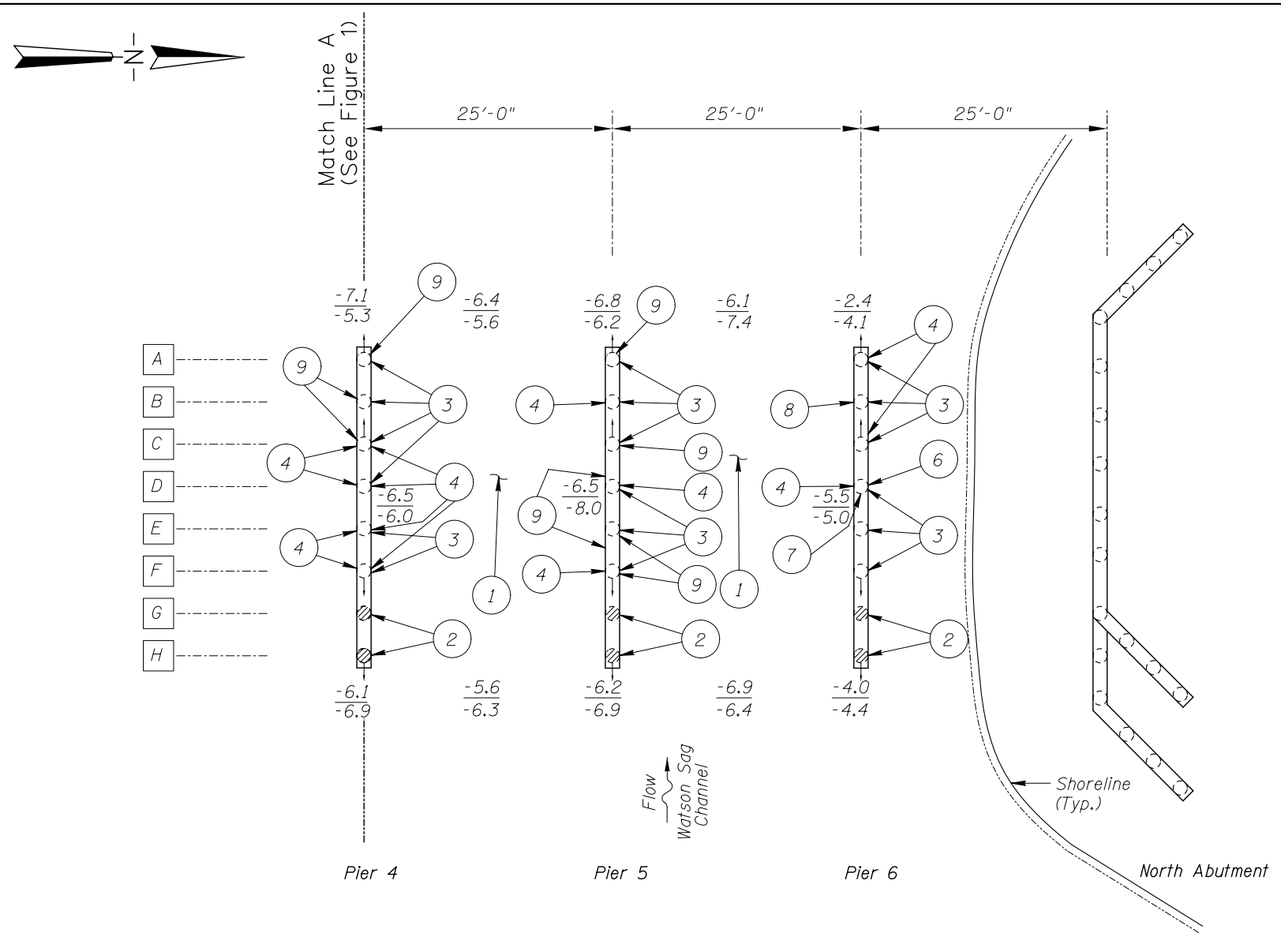
| | |
|---|---|
| -2.0 / -5.2 | Sounding Depth (10/20/07) / Sounding Depth (10/31/02) |
| | Timber Pile (under cap) |
| | Battered Timber Pile (under cap) |
| | Steel Encased Concrete Pile (under cap) |
| | Battered Steel Encased Concrete Pile (under cap) |
| A | Pile Identification Designation |
| | Steel H-pile |
| | Timber Debris |

**MINNESOTA**
**DEPARTMENT OF TRANSPORTATION**
**UNDERWATER BRIDGE INSPECTION**

STRUCTURE NO. 7137
OVER THE WATSON SAG CHANNEL
DISTRICT 8, CHIPPEWA COUNTY

# INSPECTION AND SOUNDING PLAN

| | | |
|---|---|---|
| Drawn By: LJ | COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com | Date: OCT. 2007 |
| Checked By: VR | | Scale: NTS |
| Code: 52210092 | | Figure No.: 1 |




SOUNDING PLAN

INSPECTION NOTES:

1. The channel bottom material consisted of sandy silt and scattered 6 inch diameter stones with up to 3 inches of probe rod penetration.
2. Light corrosion was observed on the steel piles from 3 feet above the waterline to the channel bottom with random minor pitting having a maximum penetration of 1/16 inch.
3. Minor splitting and checking of the timber piles was observed from the pier cap to the channel bottom with a maximum width of 1/4 inch and a maximum penetration of 1 inch.
4. Diagonal timber bracing was split through the fastener (1/4 inch width typically).
5. Abrasion damage observed on the timber pile, from 1 foot above the waterline to 2.5 feet below the waterline, approximately 8 inches wide with a maximum penetration of 0.5 inch, and pile section loss at 10%.
6. Delamination on outer shell of timber pile was observed around the waterline with maximum penetration of 1/2 inch.
7. Split in pile, from the top of the pile cap to 8 feet above the waterline with a maximum width of 1/2 inch and 2 inch of penetration.
8. Split in pile, from the pile cap to 2 feet above the waterline with a maximum width of 3/4 inch and 2 to 3 inches of penetration.
9. Diagonal bracing broken and no longer attached to pile.

Note:

All soundings based on 2007 waterline location.

Legend

| | |
|---|---|
| -2.0 / -5.2 | Sounding Depth (10/20/07) / Sounding Depth (10/37/02) |
| | Timber Pile (under cap) |
| | Battered Timber Pile (under cap) |
| | Steel Encased Concrete Pile |
| | Battered Steel Encased Concrete Pile |
| A | Pile Identification Designation |
| | Steel H-pile |

Note:

Refer to Figure 1 for General Notes.

**MINNESOTA**
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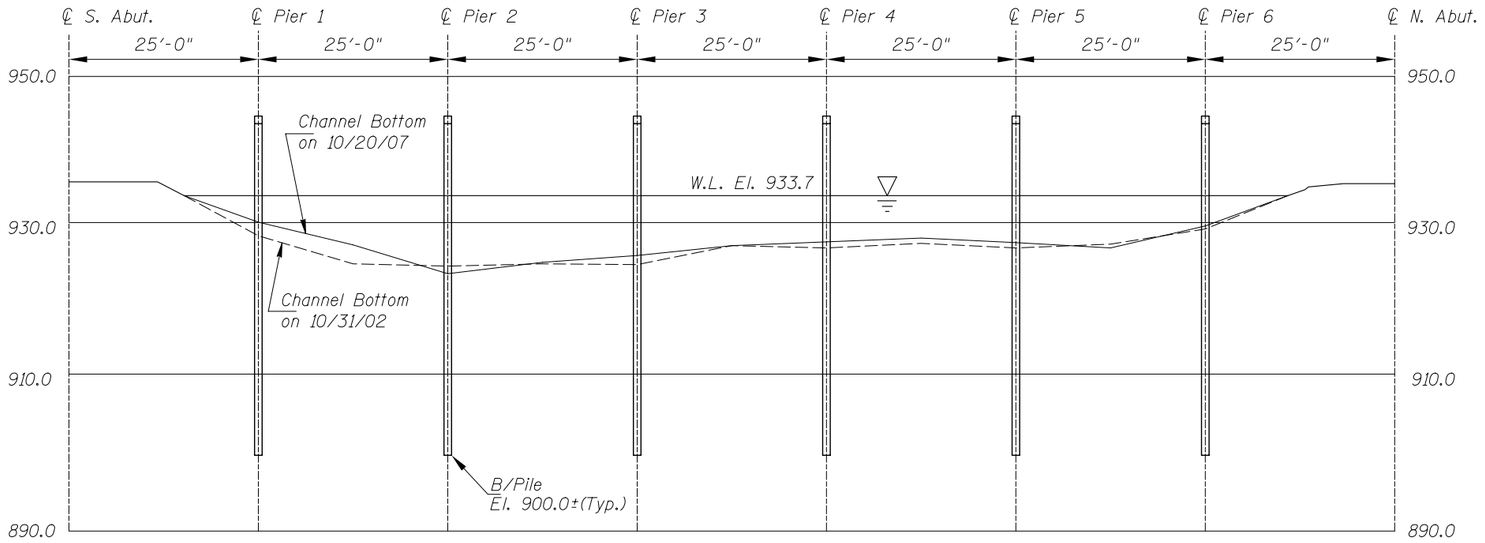
**UNDERWATER BRIDGE INSPECTION**

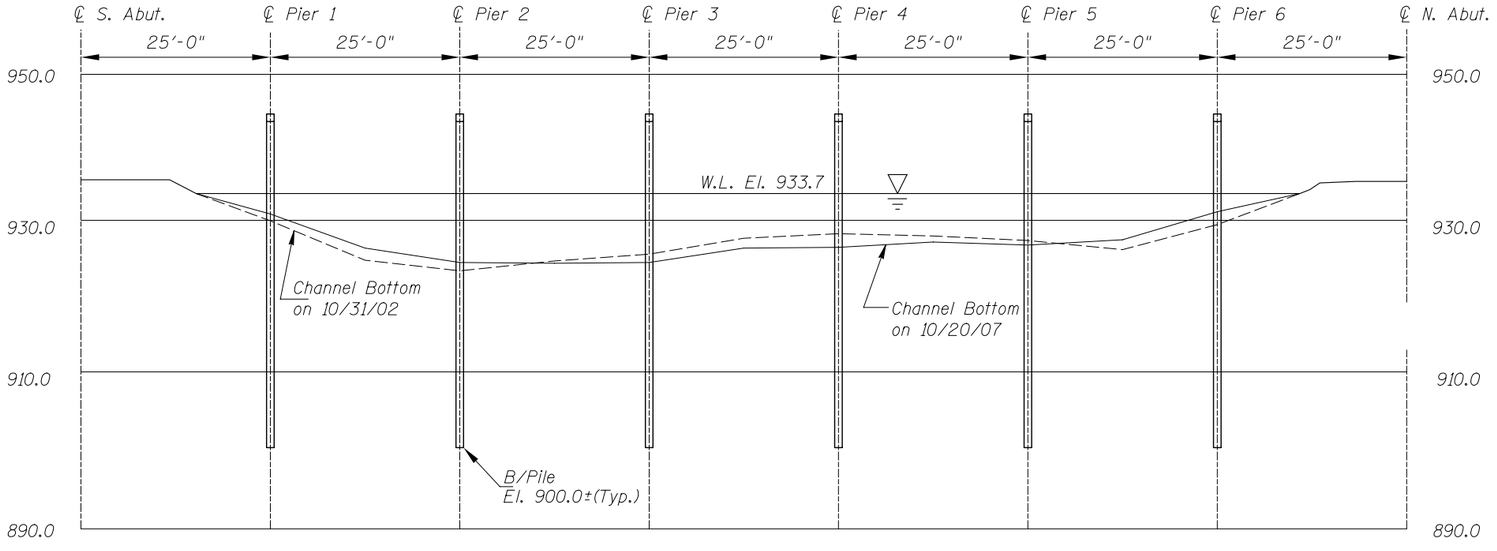
STRUCTURE NO. 7137
OVER THE WATSON SAG CHANNEL
DISTRICT 8, CHIPPEWA COUNTY

INSPECTION AND SOUNDING PLAN

| | | |
|---|---|---|
| Drawn By: LJ | COLLINS ENGINEERS, INC. 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com | Date: OCT. 2007 |
| Checked By: VR | | Scale: NTS |
| Code: 52210092 | | Figure No.: 2 |




UPSTREAM FASCIA PROFILE




DOWNSTREAM FASCIA PROFILE

Note:

Refer to Figure 1 for General Notes.

**MINNESOTA**
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DISTRICT 8, CHIPPEWA COUNTY

# UPSTREAM AND DOWNSTREAM FASCIA PROFILES

| | | |
|---|---|---|
| Drawn By: LJ | COLLINS ENGINEERS 123 North Wacker Drive Suite 300 Chicago, IL 60606 (312) 704-9300 www.collinsengr.com | Date: OCT. 2007 |
| Checked By: VR | | Scale: 1"=20' |
| Code: 52210092 | | Figure No.: 3 |

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES
DAILY DIVING REPORT

INSPECTORS: Collins Engineers, Inc. DATE: October 20, 2007
ON-SITE TEAM LEADER: Daniel G. Stromberg, P.E., S.E.
BRIDGE NO: 7137 WEATHER: Sunny, 65°F
WATERWAY CROSSED: Watson Sag Channel
DIVING OPERATION: X SCUBA _____ SURFACE SUPPLIED AIR
_____ OTHER
PERSONNEL: Clayton G. Brookins, Valerie Roustan
EQUIPMENT: Scuba, U/W Light, Lead Line, Scraper, Probe Rod, Sounding Pole, Camera
TIME IN WATER: 1:30p.m.
TIME OUT OF WATER: 2:00 p.m.
WATERWAY DATA: VELOCITY Negligible/None
VISIBILITY Negligible/None
DEPTH 10.3 feet maximum at Pier 2.
ELEMENTS INSPECTED: Piers 1 through 6
REMARKS: Overall, the timber piles were in satisfactory condition below water. The timber piles were typically weathered with minor splitting and checking up to 1/4 inch wide and up to 1 inch deep. Numerous timber diagonal cross braces were split through the connection to the timber piles or broken off completely. The steel piles were in good condition and displayed only a light layer of corrosion with minor random pitting and nodular corrosion from 3 feet above the waterline to the channel bottom. The channel bottom around the substructure units appeared to be in stable condition with no evidence of significant scour or appreciable changes since the previous inspection.

FURTHER ACTION NEEDED: X YES _____ NO

Replace the split and/or broken diagonal timber cross bracing to restore the lateral stability of the structure.

Reinspect the submerged substructure units at the normal maximum recommended (NBIS) interval of five (5) years.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

# UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 7137
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED Watson Sag Channel

INSPECTION DATE October 20, 2007

NOTE: USE ALL APPLICABLE CONDITION DEFINITIONS AS DEFINED IN THE MINNESOTA RECORDING AND CODING GUIDE INCLUDING GENERAL, SUBSTRUCTURE, CHANNEL AND PROTECTION, AND CULVERTS AND WALL DEFINITIONS TO COMPLETE THIS FORM.

## CONDITION RATING

| | | | SUBSTRUCTURE | | | | | | CHANNEL | | | | | GENERAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT REFERENCE NO. | UNIT DESCRIPTION | MAXIMUM DEPTH OF WATER | PILING (TIMBER) | COLUMNS, SHAFTS, OR FACES* | FOOTINGS | DISPLACEMENT | OTHER (BRACING) | OVERALL SUBSTRUCTURE CONDITION CODE* | SCOUR | EMBANKMENT EROSION | EMBANKMENT PROTECTION | OTHER (DRIFT/DEBRIS) | OVERALL CHANNEL & PROTECTION CONDITION | CONCRETE | STEEL (PILES) | TIMBER | LOSS OF SECTION | PREVIOUS REPAIR OR MAINTENANCE | OTHER |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | Pier 1 | 7.0’ | 6 | N | N | 8 | 6 | 6 | 8 | 8 | 8 | 8 | 8 | N | 7 | 6 | 7 | 7 | N |
| | Pier 2 | 10.3’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 3 | 9.1’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 4 | 7.1’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 5 | 6.8’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 6 | 5.5’ | 6 | N | N | 8 | 6 | 6 | 8 | 8 | 8 | N | 8 | N | 7 | 6 | 7 | N | N |

*UNDERWATER PORTION ONLY

REMARKS: Overall, the timber piles were in satisfactory condition below water. The timber piles were typically weathered with minor splitting and checking up to 1/4 inch wide and up to 1 inch deep. Numerous timber diagonal cross braces were split through the connection to the timber piles or broken off completely. The steel piles were in good condition and displayed only a light layer of corrosion with minor random pitting and nodular corrosion from 3 feet above the waterline to the channel bottom. The channel bottom around the substructure units appeared to be in stable condition with no evidence of significant scour or appreciable changes since the previous inspection.

NOTES: ATTACH SKETCHES AS NEEDED, IDENTIFY REMARK BY REFERRING TO UNIT REFERENCE NO. AND REMARK NO.
USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.

MINNESOTA DEPARTMENT OF TRANSPORTATION
OFFICE OF BRIDGES AND STRUCTURES

# UNDERWATER INSPECTION CONDITION RATING FORM

BRIDGE NO. 7137
INSPECTORS Collins Engineers, Inc.
ON-SITE TEAM LEADER Daniel G. Stromberg, P.E., S.E.
WATERWAY CROSSED Watson Sag Channel

INSPECTION DATE October 20, 2007

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## CONDITION RATING

| | | | SUBSTRUCTURE | | | | | | CHANNEL | | | | | GENERAL | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| UNIT REFERENCE NO. | UNIT DESCRIPTION | MAXIMUM DEPTH OF WATER | PILING (TIMBER) | COLUMNS, SHAFTS, OR FACES* | FOOTINGS | DISPLACEMENT | OTHER (BRACING) | OVERALL SUBSTRUCTURE CONDITION CODE* | SCOUR | EMBANKMENT EROSION | EMBANKMENT PROTECTION | OTHER (DRIFT/DEBRIS) | OVERALL CHANNEL & PROTECTION CONDITION | CONCRETE | STEEL (PILES) | TIMBER | LOSS OF SECTION | PREVIOUS REPAIR OR MAINTENANCE | OTHER |
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| | Pier 1 | 7.0’ | 6 | N | N | 8 | 6 | 6 | 8 | 8 | 8 | 8 | 8 | N | 7 | 6 | 7 | 7 | N |
| | Pier 2 | 10.3’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 3 | 9.1’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 4 | 7.1’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 5 | 6.8’ | 6 | N | N | 8 | 6 | 6 | 8 | N | N | N | 8 | N | 7 | 6 | 7 | N | N |
| | Pier 6 | 5.5’ | 6 | N | N | 8 | 6 | 6 | 8 | 8 | 8 | N | 8 | N | 7 | 6 | 7 | N | N |

*UNDERWATER PORTION ONLY

REMARKS: Overall, the timber piles were in satisfactory condition below water. The timber piles were typically weathered with minor splitting and checking up to 1/4 inch wide and up to 1 inch deep. Numerous timber diagonal cross braces were split through the connection to the timber piles or broken off completely. The steel piles were in good condition and displayed only a light layer of corrosion with minor random pitting and nodular corrosion from 3 feet above the waterline to the channel bottom. The channel bottom around the substructure units appeared to be in stable condition with no evidence of significant scour or appreciable changes since the previous inspection.

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USE GENERAL SECTION TO IDENTIFY OVERALL PRESENCE OF SPALLS, CRACKS, CORROSION, ETC.